From:	Casey, Carolyn
To:	"Craig Ziady"
Cc:	"bhoskins@fslassociates.com"; "Miano, John (DEP)"
Subject:	RE: Cummings Center, Beverly, MA
Date:	Thursday, February 19, 2015 1:53:19 PM
Attachments:	CC EPAComment Response to Sept 27 review of IDA ccasey responses 19 Feb.pdf

I have attached a slightly revised version of one of the documents sent earlier today. The changes are in several locations and changed "detection limit" to "reporting limit" similar to the following…
Use the reporting limit (not ½) for the non-detects results in the risk calculations.
Sorry about the changes.
Thanks
Carolyn

From: Casey, Carolyn
Sent: Thursday, February 19, 2015 8:26 AM
To: 'Craig Ziady'
Cc: bhoskins@fslassociates.com; 'Miano, John (DEP)'
Subject: RE: Cummings Center, Beverly, MA

Craig Ziady craig@cummings.com
bhoskins@fslassociates.com

Thank you for the submittal. Please see the attached comments on the work plan and a 2nd round of comments on the Indoor Air Sampling Analysis
and Risk Characterization Report Dated May 24, 2013.
We are frustrated with the length of time it has taken to evaluate this pathway especially since there are sensitive receptors involved. We started discussions about evaluating the indoor air pathway as far back as the summer of 2011. Further, Cummings Properties failed to complete a sampling round this past summer as proposed with no explanation why.
Few if any of the comments we sent 9/30/13 appear to have been satisfactorily addressed in the work plan as stated they would be in the response to comments.
We do not want Cummings Properties to miss the opportunity to collect another round of indoor air samples and soil gas samples this winter season. Please address the necessary comments within a week and submit the revised QAPP and WP to EPA for review and approval prior to initiating another round of sampling. Many of the comments can be addressed when the additional sampling results are reported. The excessive delays in submitting work plans has again resulted in our need to rush through a review leaving little time for discussion or revisions.
Please contact me with any questions.
Thank You
Carolyn

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From: Craig Ziady [mailto:craig@cummings.com]
Sent: Wednesday, February 18, 2015 1:43 PM
To: Casey, Carolyn
Cc: bhoskins@fslassociates.com
Subject: RE: Cummings Center, Beverly, MA

Hi Carolyn – Please be advised, pursuant to Section 3.0 of the Winter 2015 Soil Gas and Indoor Air Sampling Plan, that soil gas and indoor air sampling at Cummings Center in Beverly, MA is scheduled to commence on Wednesday, February 25 at 6:30 a.m.

If you have any questions, please do not hesitate to contact me.

Thanks very much.

Craig

Craig J. Ziady
General Counsel
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www.cummings.com

From: Craig Ziady
Sent: Thursday, January 22, 2015 6:17 PM
To: Casey.Carolyn@epa.gov
Cc: bhoskins@fslassociates.com
Subject: Cummings Center, Beverly, MA

Hi Carolyn – Enclosed, pursuant to your request, please find the Winter 2015 soil gas and indoor air sampling plan for Cummings Center.

Please let me know if you have any questions.

Thanks very much.

Craig

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you have received this communication in error, please notify us immediately by replying to the message and deleting it from your computer. Thank you. Cummings Properties.

February 2015 Technical Review of the Indoor Air Sampling Analysis and Risk Characterization Report
Former United Shoe Machinery Division North Parcel
181 Elliot Street, Beverly, MA Dated May 24, 2013
EPA ID # MAD043415991
Mass DEP RTN 3-610

New comments

Please provide an update to the 2012 QAPP. Verify that the threshold values are up to date with the revised DEP VI guidance.
http://www.mass.gov/eea/docs/dep/cleanup/laws/vifin.pdf
"Revision Notes: March 7, 2013 - revisions were made to make consistent the rounding methodology used in the tables in Appendices I and II. These adjustments resulted in slight differences in some of the values in Tables I.2, I.3, II.1 and II.2. February 22, 2013- revisions were made to Appendix I (Indoor Air Threshold Values) and Appendix II (Sub-Slab Soil Gas Screening Values) to reflect revised toxicity values and correct errors."

Include any other necessary updates. Please provide such updates by using track changes and appropriately document that it is a revised version. Please provide a document with track changes and one with all changes accepted.

The Form F-2 table (Sampling and Analytical Methods Requirements Table) from the QAPP should be updated and included in this sampling plan. It should include both sampling types (indoor air and soil gas).

Please provide an SOP for soil gas sampling in the sampling plan.

Based on the Mass DEP indoor air policy, the ambient air sample should be placed 5-15 feet away from the building being assessed and at a height of about 5 feet off the ground (i.e. midpoint of ground story). There are sufficient samples on the roof of the garage.

Please include a field blank to accompany the canisters during this sampling event. This is a recommended quality control sample for air sampling.

Previous comments and responses follow

General Comments

1) A list of contaminants of concern (COCs) from the site assessment and remediation conducted in the 1980s would be useful. Please provide a list of COCs detected in both soils and groundwater.

Response: This site has undergone substantial previous assessment and remediation since the late 1980s. Numerous reports documenting the COCs and the nature and extent of remediation are available for review. The COCs are also summarized in the

Quality Assurance Project Plan/Sampling and Analysis Plan (QAPP/SAP), dated July 30, 2012 for the indoor air sampling.

EPA response: It is common practice to include a list of COCs.

2) The EPA's review of the indoor air sampling results and risk assessment identified the following issues. The risk assessment:

- is not comprehensive,
- is not entirely site specific,
- does not provide cumulative risk,
- presents arguments to minimize the risk using a variety of approaches, but the data provided is insufficient to support the arguments presented, and
- did not achieve reporting limits that were less than the screening levels for multiple contaminants.

Response: This risk assessment was not intended to be comprehensive or to provide cumulative total site risk. Previous risk assessments have established the risk to soil and groundwater at the site. This risk assessment, as explained in the QAPP/SAP, was designed to provide risk estimates solely to indoor air at the most conservative exposure point – the four daycare and school facilities at the site. While the risk assessment for indoor air may not be site-specific for the entire site, it represents the most conservative exposure for indoor air. The various risk assessment approaches were designed to provide multiple methods (e.g., including or excluding background concentrations) of examining a range or risk. However, as the risk assessment conclusion shows, the variety of approaches yielded little difference as to whether a significant risk to indoor air was present or not at each of the four locations.

The contaminants that did not achieve the EPA screening levels are shown in the table below:

Compound	Laboratory Reporting Limit Achieved (ug/m3)	EPA Screening Level (ug/m3)
1,1,2,2-Tetrachloroethane	0.137	0.042
1,2-Dibromoethane	0.154	0.0041
1,4-Dioxane	0.721	0.32
3-Chloropropene	0.626	0.41
Benzyl Chloride	1.04	0.05
Bromodichloromethane	0.134	0.066
Dibromochloromethane	0.17	0.09
Hexachlorobutadiene	0.533	0.11
Naphthalene	0.262	0.072
Vinyl Bromide	0.874	0.076

The laboratory has confirmed that the reporting limits are the best that can be achieved with their equipment. For future sampling events, the laboratory could potentially report results between the reporting limit and the method detection limit (MDL). Generally the MDL will be 3-5 times lower than the reporting limit. Any value detected at this level would be qualified with a J flag. However, there are still compounds where the EPA screening level is more than an order of magnitude lower than the MDL (1,2-dibromoethane, benzyl chloride, vinyl bromide).

EPA Response: Where appropriate, please report the samples qualified with a J flag. J flagged values can be used in the risk assessment. Based on the limited air data, for the other contaminants use the reporting limit (not ½) for the concentrations in the risk calculations.

3) Despite the issues identified, the risk assessment is sufficient for a preliminary estimate of risk due to vapor intrusion. Based on the two sampling events, the Hazard Quotient is calculated at a value of less than one and therefore, the noncancer risks are not sufficiently high to require an immediate action (refer to specific comments 12 and 14, below).

Response: No response required.

4) The total cancer risk calculated is 2×10^{-5} for Suites 157-J and 149-J, and Buildings 600 and 500. The cancer risks are within EPA's risk range. EPA's policy is explained in OSWER Directive 9355.0-30, Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, April 22, 1991. EPA uses the risk range of 10^{-6} to 10^{-4} as a "target range" within which EPA tries to manage risks as part of a site cleanup. Once a decision has been made to take an action, EPA has a policy to work towards a cleanup that will achieve a 10^{-6} risk or lower; however, EPA could accept a cleanup anywhere in the risk range. Factors that influence the determination of the appropriate risk include the presence of sensitive receptors. At this site the cancer risk is 2×10^{-5}; however, the site contains two daycare facilities, two schools, and an adult daycare. Children are at a sensitive period of development for air exposures, and adults in daycare could be expected to have respiratory or liver issues that may impair their ability to deal with excess indoor air contaminants.
http://www.epa.gov/oswer/riskassessment/pdf/baseline.pdf

Response: It should be noted that the calculated cancer risk from the outside air was 1.9 x 10^{-5} and this number and the numbers cited in the comment were based on the inclusion of risk to compounds that were not detected. With the removal of risk to compounds not detected, the risk at all locations dropped by an order of magnitude. Three non-detected compounds were responsible for the majority of the cancer risk; 1,2-dibromoethane, benzyl chloride, and vinyl bromide result in a combined cancer risk of 1.26 x 10^{-5} at all locations when using one-half of their analytical detection limits as the exposure point concentration (please see the response to comment No. 2 above).

EPA response: This discussion should be included in the risk characterization section. It's

acceptable to include the risk calculations with and without the non-detect results (using the reporting limit, not ½), but it is up to the risk manager to make a final determination regarding risk. Also include a discussion of how the calculations can underestimate risk.

5) To improve the risk assessment to more accurately reflect the current and future risk:

- Conduct additional rounds of indoor air sampling;
- Achieve reporting limits that are less than the screening levels;
- Refine the Conceptual Site Model (e.g., consider other potential sources, etc.); and
- Use more site specific exposure factors to improve the accuracy of the risk calculations.

Nine compounds exceeded the EPA's and MA DEP's residential screening levels. Consider evaluating whether it would be more cost efficient to improve the building ventilation, remediate with a sub-slab soil ventilation system, or revert back to the Activity and Use Limitations. Remediation may be more efficient than expending a lot of effort on collecting additional indoor air and soil gas sampling data to improve the site investigation and improve the risk assessment in order to make a final remedy decision. The limited soil gas sampling investigation that was conducted in order to eliminate the AUL appears insufficient or may not represent current conditions.

From the MassDEP Interim Final Vapor Intrusion Guidance, December 2011, "MassDEP recommends greater sampling frequency for more sensitive receptors. For daycares, schools, and residences, MassDEP recommends that at least two to four indoor air sampling rounds be conducted, depending on the degree of subsurface contamination, before determining that the vapor intrusion pathway does not exist. For commercial and industrial buildings, two indoor air sampling rounds are recommended to provide sufficient information to make decisions regarding vapor intrusion. In order to obtain an estimate of long-term conditions (chronic exposure), the sampling rounds should be obtained over at least two different seasons, one of which is winter."

Response: Two sampling rounds (summer 2012 and winter 2013) have already been performed, consistent with the MassDEP policy referred to in this comment. However, the purpose of the vapor intrusion policy is to perform sufficient data collection to determine whether or not vapor intrusion needs to be quantified in a detailed risk assessment as a complete exposure pathway. The risk characterization here was performed using a conservative approach and did quantify risk from the indoor air pathway; it included all detected compounds as potential contaminants of concern, regardless of whether the source was from vapor intrusion, an indoor source, or another source. By using this conservative approach, much of what is contained in the vapor intrusion policy is no longer relevant, such as the comparison of indoor air data to screening levels. That according to the risk characterization, no significant risk to indoor air was present in three of the four indoor sampling locations obviates the need to continue to search for the source of contaminants in these three areas. In the fourth location, where a potential significant risk was calculated based on the presence of petroleum compounds, additional assessment will be necessary to clarify the source of

these compounds.

Regarding the request to achieve better reporting limits, please see the response to Comment No. 2 above.

Regarding the request to refine the Conceptual Site Model, the overall site model was established during the assessment and remediation work by Haley and Aldrich in the 1990s. The model for the presence of petroleum vapor in Suite 157-J in Building 100 will be refined to better define the reason(s) for the presence of those vapors.

Regarding the request to use more site-specific exposure factors to improve the accuracy of the risk calculations, the exposure frequency and exposure duration provide significant information in this context:

$$ADE = \frac{EPC \times Exposure\ Frequency \times Exposure\ Duration \times Exposure\ Period}{Averaging\ Period \times Conversion\ Factor}$$

where:

EPC = Exposure Point Concentration ($\mu g/m^3$)
Exposure Frequency = 12 hours per day
Exposure Duration = 250 days per year
Exposure Period = 7 years
Averaging Period = 7 years
Conversion Factor = (1000 µg/mg) x (8760 hours/year)

And:

$$LADE = \frac{EPC \times Exposure\ Frequency \times Exposure\ Duration \times Exposure\ Period}{Lifetime\ Averaging\ Period \times Conversion\ Factor}$$

where:

EPC = Exposure Point Concentration ($\mu g/m^3$) Exposure
Frequency = 12 hours per day
Exposure Duration = 250 days per year
Exposure Period = 30 years
Lifetime Averaging Period = 70 years
Conversion Factor = 8760 hours/year

The values chosen for exposure frequency and exposure duration represent the respective Reasonable Maximum Exposure (RME). Exposure frequency of 12 hours per day relates to a child who arrives at daycare early in the morning prior to the parent/guardian traveling to work for his/her 8AM-5PM job and then leaves the facility in the evening when the parent returns to pick up the child. As an example, Bright Horizons in Building 100 has operating hours from 7AM-6PM. The site model thus accounted for the possibility that a child could be present for all 11 hours that the facility is open. The exposure duration of 250 days represents the EPA risk assumption of the annual number of days for a commercial worker –5 days per week for 50 weeks per year. While alternative values for exposure frequency and duration could be selected, they would only reduce the values selected in the risk assessment and would accordingly result in a lower risk.

EPA response: this RME will tentatively be acceptable. If a better referenced quantitative value for the RME becomes available please use it. The RME represents the 90th to 99.9th percentile of the time children spend in daycare.

6) There are 30 contaminants of concern that were detected in both indoor air and soil gas sampling. It is noted that sampling of these two media was not conducted concurrently as guidance recommends but several years apart. Guidance recommends concurrent sampling of groundwater, soil gas, and indoor air in order to evaluate the indoor air pathway using multiple lines of evidence. Because of the inherent uncertainty with the sampling and analytical and risk assessment processes for the indoor air pathway, a final remedy would likely require a more thorough evaluation of this pathway or remediation to eliminate the pathway.

Response: The guidance referenced ("MassDEP Interim Final Vapor Intrusion Guidance, December 2011") only recommends that IF a sampling plan is to include performing sampling on multiple media, then they are to be collected in the same approximate timeframe. The guidance does not state that multiple media must be sampled in every situation to evaluate the presence or lack of vapor intrusion.

The main purpose of the indoor air sampling was to make an initial determination whether the presence of indoor air contaminants represented a potential significant risk. It was NOT intended to yield definitive conclusions as to whether vapor intrusion was occurring unless the technical data demonstrated clear evidence of lack of vapor intrusion. The risk assessment calculations were performed using the most conservative assumptions regarding contaminants of concern; it took all detected compounds into consideration and did not make assumptions as to the rationale for their presence (e.g., vapor intrusion, indoor air source, etc.). This methodology results in an overly conservative risk characterization, which is layered upon the conservative assumptions already built into the site-specific risk assessment protocols established by EPA and MassDEP.

No such comments regarding concurrent sampling were provided in response to the July 2012 QAPP/SAP, which was submitted and approved prior to the first air sampling round in September 2012.

EPA response: It is common practice to conduct soil gas sampling concurrently with indoor air sampling. In addition, it was requested that such sampling be conducted in these comments and prior to the last round of sampling.

7) Please submit the complete set of field notes for both sampling events.

Response: These can be provided.

EPA response: These have not yet been submitted. Please provide these documents.

8) Please provide documentation showing that a soil management plan was used when the parking garage was constructed and excavation in front lobby of building 100 was conducted.

Response: This can be provided.

EPA response: These have not yet been submitted. Please provide these documents.

Specific Comments

3.2 Air Sample Collection

1) For the previous indoor air sampling, please provide additional documentation on the placement of the canisters, including height. Canisters should be placed at a height that is representative of the typical breathing zone level of the children. Indoor air samples should be collected in locations where children spend the majority of their day. Please provide copies of photographs showing canister locations.

Response: Photographs were not taken during the previously completed indoor air sampling, but they can be collected during future sampling events. Canisters were generally placed in offices on top of desks or tables – around 3-4 feet in height. Canisters were not placed in rooms which would be directly accessible to children to make sure that the canisters remained undisturbed throughout sampling.

EPA response: Please ensure photographs are taken of sampling efforts for documentation of all future sampling.

2) If sample disturbance is a possible issue, sampling should take place on the weekends when the facilities are closed.

Response: Disturbance is always a possible issue, but the canisters were placed in offices and not in children's classrooms. However, office doors were not closed during sampling and, given the HVAC system, the same air quality should be present in the offices and in the classrooms (unless a local indoor source of air contaminants is present in a specific room).

EPA response: It's stated above that "*…given the HVAC system, the same air quality should be present in the offices and in the classrooms (unless a local indoor source of air contaminants is present in a specific room).*" It could also be said that the same air quality should be present in the offices and in the classrooms unless a local preferential pathway exists (e.g., utility intrusion). Canisters should be placed in areas most occupied by children but also taking into consideration other criteria such as utilities and PID readings.

3) For any subsequent sampling events, consider the need for multiple canisters per school/day care. There are a number of factors that go into deciding how many and where samples need to be collected to effectively represent indoor air quality relative to the source of interest. The number of locations selected depends on factors such as, but not limited to: how the building is being used, who is occupying the building, whether there are any areas where soil gas can migrate into the building, where individuals spend most of their time and what the buildings HVAC system is and how it circulates air in the building.

Response: The need for additional canisters will be considered.

EPA response: No comment necessary. The work plan proposes the use of 3 sampling locations and one duplicate.

5.0 Summary of Air Sampling Results

4) On page 11, cis-1,2-dichloroethylene in missing from the list of compounds "detected in indoor air and not in historic soil gas samples." Please add this constituent to the list.

Response: cis-1,2-dichloroethylene will be added to the list.

EPA response: The document was not revised. Cis-1,2-dichloroethylene has not been added to the list.

5) Page 11 contains the following statement:

> "The primary site contaminants during site assessment and remediation conducted in the 1980s and 1990s consisted of chlorinated solvents and petroleum hydrocarbons. 11 compounds that had been detected in historic soil gas samples were not detected in the indoor air. Several of these 11 compounds are related to chlorinated solvents and/or their degradation products, most notably trichloroethylene, 1,1-dichloroethane, and 1,1-dichloroethene which were detected during the 1980s site assessment. As these compounds were not detected in indoor air in any of the sampling locations, this is an indication that vapor intrusion is not occurring within the buildings at the site."

Contrary to the above statement, 28 constituents and all 3 APH fractions detected in both indoor air and soil gas may indicate that vapor intrusion is occurring.

Regarding the site assessment in 1980's discussed on page 11. The assessment included the installation of 139 groundwater monitoring wells, most of which were only sampled once. This line of evidence used in making decisions on vapor intrusion is lacking. Soil sampling in the 1980s was not as reliable as it is now with respect to identifying volatile organics due to the lack of standard operating procedures for preserving the samples; this line of evidence may also be lacking.

Response: Contrary to the above comment, 28 constituents and all 3 APH fractions detected in both indoor air and soil gas does not necessarily indicate that vapor intrusion is occurring. There needs to be a logical connection via chemical signature between soil gas and indoor air data to conclude that vapor intrusion is occurring. Such a logical connection is lacking at this site, which strongly indicates that vapor intrusion is <u>not</u> occurring. The tables presented on page 11 of the report were generic and included all soil gas and indoor air data over the entire site to show similarities and differences in detected compounds. To give a more specific example, for soil gas and indoor air samples collected at Building 100,19 compounds and 2 APH fractions were detected in soil gas as opposed to 29 compounds and 3 APH fractions detected in indoor

air. In total, there were 13 compounds and 2 APH fractions that were detected in both soil gas and indoor air. Of those compounds in common, six compounds (acetone, dichlorodifluromethane, ethanol, hexane, isopropanol, and methylene chloride) and both APH fractions were detected in higher concentrations in indoor air than in soil gas. When concentrations are higher in indoor air than in soil gas, this is a compelling indication that the presence of those compounds at those levels in air is due to a source other than vapor intrusion. This is not to say that vapor intrusion is not potentially occurring, only that it is not the primary source of contaminants.

In addition, this evaluation of potential air contaminant source(s) pales in comparison to the actual risk to indoor air contaminants. If no significant risk is present to indoor air contaminants (as was concluded for three of the four indoor sampling locations) the source of the contaminants does not merit further evaluation. For the single location where a potential significant risk was identified due to the presence of petroleum hydrocarbons (Suite 157-J in Building 100), the levels of petroleum hydrocarbons in the indoor air exceeded the concentrations detected in soil gas at Building 100, which strongly indicates that the petroleum source is not related to vapor intrusion.

EPA response: Above it is stated that *"When concentrations are higher in indoor air than in soil gas, this is a compelling indication that the presence of those compounds at those levels in air is due to a source other than vapor intrusion."* This may be an accurate statement when the soil gas sampling is representative. Soil gas samples were not collected concurrently with indoor air samples and were not collected below the building slab. In consideration of spatial and temporal variations, preferential pathways and other uncertainties associated with sampling, the results may not be representative of actual conditions and should be used with caution and considered as one of multiple lines of evidence when making a determination regarding the existence of this pathway.

6) The site investigation should be improved by obtaining soil gas sampling data immediately following the additional rounds of indoor air sampling. In addition to sub slab sampling, sampling in the underground utility corridors, if accessible, would provide valuable information. Less expensive soil gas sampling can be conducted by locating cracks in the floors (may be visible in utility closets and other areas that are not carpeted) and locations where utilities enter the building (vapor intrusion pathways).

Response: Again, the rationale for the indoor air sampling was to determine whether indoor air contaminants (regardless of source) were a potential significant risk. Additional sampling of soil gas, utility corridors, etc. is not warranted if no significant risk exists to indoor air. The report concludes that the only location where additional assessment is recommended is in Suite 157-J in Building 100 due to the presence of elevated petroleum hydrocarbons.

EPA response: In accordance with the MCP, an additional goal is to determine if there is a critical exposure pathway. The limited sampling that has been conducted is insufficient to make this determination.

7) The last paragraph on page 11 states that "…the majority of these compounds are not related to the petroleum and solvent compounds identified during the 1980's site assessment and appear to be unrelated to the former USM operations." A number of the

compounds detected in indoor air are components of petroleum products (USM constituents of concern), including the trimethylbenzenes that were detected in both indoor air and soil gas.

Response: No response required.

EPA response: No further response.

Section 6.0 Risk Characterization

Section 6.2.3 Calculation of Exposure Dose, page 13

8) EPA prefers to see some supporting documentation or references for the parameters chosen for the calculation of exposure. The parameters should be as site specific as possible. EPA requires two risk calculations—one using central tendency parameters and a second using high end parameters. At a minimum, the calculations need the high end parameters because EPA makes decisions based upon the individual who experiences the Reasonable Maximum Exposure (RME).

Response: Please see the response to Comment No.5 above. While it is not specifically stated in the report, the parameters for Exposure Frequency and Exposure Duration reflect the high end so the risk assessment calculates the RME, which is consistent with the intention to provide the most conservative result in order to establish whether the indoor air pathway was a potential significant risk. If no significant risk is determined using the RME, then it follows that the pathway does not represent a significant risk, and no further evaluation is necessary. A separate risk calculation can be performed for the central tendency, but the total risk will be lower than the risk based on the RME. The value of using central tendency parameters is questionable if risk decisions are based on use of the high end parameters.

EPA response: A central tendency exposure parameter allows one to present arguments to risk managers and the public about what would be a more common type of exposure in the population. It is required in EPA Superfund risk assessments but is optional here.

9) The exposure frequency of 12 hours a day is unsupported. The value chosen appears greater than the central tendency; it is not clear how it relates to high end exposure.

Response: Please see the response to Comment No.5 above. The parameters chosen represent the high end exposure. The value of using central tendency parameters is questionable if risk decisions are based on use of the high end parameters.

EPA response: Please provide a citation for the source of quantitative RME values from the 90^{th} to 99.9^{th} percentile of the population of children in daycare. Otherwise the 12 hours per day can be used.

10) The exposure duration of 250 days is unsupported although logical. If an employee works for 250 days per year would their child be in day care for the same number of

days? The value chosen appears greater than the central tendency; it is not clear how it relates to high end exposure. For example, a representation of high end exposure based on data from the daycare facilities and schools at the site could be used here. If there is difficulty obtaining this site specific information due to privacy issues, published data from schools in Massachusetts could be used.

Response: Please see the response to Comment No.5 above. The parameters chosen represent the high end exposure. The value of using central tendency parameters is questionable if risk decisions are based on use of the high end parameters.

EPA response: If one identifies a source of quantitative RME values from the 90th to 99.9th percentile of the number of days in daycare, cite them. Otherwise the 250 days per year can be used.

Section 6.2.4 Exposure Points and Exposure Point Concentrations, page 14

11) The use of one-half the detection limit is acceptable for the chemicals for which there was at least one detect in any of the data collected over the two sampling events. Given the limited sampling, it would be more appropriate to use the detection limit to represent the non- detect results for the seven chemicals that were never detected in the indoor sampling results and where the reporting limits exceeded the screening levels.

Response: Please see the response to General Comment No.2 regarding chemicals where the reporting limits exceeded the screening levels.

EPA's Risk Assessment Guidance for Superfund states that the use of one-half the detection limit is acceptable for chemicals for which there was at least one detect in any of the data, but if the chemical is not detected in any samples, then it is generally eliminated. Chemicals that were not detected in samples from a given medium (i.e., non-detects) but that may be present at the site also may be included in the risk assessment if an evaluation of the risks potentially present at the detection limit is desired.

For the seven chemicals referred to in this comment, these compounds were also never detected in historic soil gas samples. Based on this information, these compounds would typically be eliminated from a risk assessment. Analysis of future air samples may be able to achieve 3-5 times better than the previous reported limit, which may be able to achieve EPA screening levels for some of the compounds, but due to the limits of analytical technology, the screening levels for 1,2-dibromoethane, benzyl chloride, and vinyl bromide will not be achieved.

EPA response: Substitute the reporting limit (not ½) for the non-detects results in the risk calculations.

Section 6.4 Characterization of risk of Harm to Human Health
Section 6.4.1 Methodology, page 15

12) EPA guidance suggests that the Hazard Indices be separated by target organ or system. However, the Hazard Quotient would still be less than one.

Response: The above statement is true; however, separating individual chemical hazard indices based on target organ or system is not always clear, especially when the reference concentration is based on impact to multiple organs. Taking the sum of all individual hazard indices as the total hazard index is the most conservative approach for noncarcinogenic impacts and is the approach used by MassDEP.

EPA response: Identify the target organ or system and calculate separate HQs by target organ. A total HQ can still be calculated and clearly identify as such. Contact EPA if target organs for a particular chemical cannot be located.

Section 8.0 Conclusions and Recommendations

13) Page 22 of this section states the following, "While there was no evidence of storage of petroleum compounds during the pre-screening assessment in September 2012 in Suite 157-J, there are multiple commercial products that, if present at the space, could have resulted in the elevated levels detected in the air samples. For instance, the presence of cigarette smoke- related compounds on workers' clothing could result in hydrocarbon detection in the air samples.

If this statement is referring to the day care workers, they could be questioned as to whether or not they smoke and if so, sampling on a Saturday or Sunday may eliminate this questionable source. Alternately, or in addition, other possible sources to consider are (1) sub-slab vapor intrusion, (2) present or former underground storage tanks (3) adjacent suite usage of COCs (i.e., is there still an autobody shop and/or diesel mechanics shops in the north-east and north-west corners, respectively, of building 100?). Refer to attachment 1.

Response: Indoor sources are suspected, rather than vapor intrusion, as the petroleum concentrations detected in indoor air were higher than those detected in historic soil gas samples. The entire facility has undergone substantial renovation and change since the USM days. There are no longer autobody shops or mechanic shops in Cummings Center. The location(s) of particular potential indoor air contaminant sources have not yet been identified.

EPA response: Based on the work plan submitted, it's not apparent how this will be addressed. If no attempt is made to identify confounding sources, please refrain from attributing contamination to other indoor sources.

14) Tables 3 to 7. Please note that EPA guidance suggests the use of a sub chronic reference concentration (RfC) of 7×10^{-2} ug/m3 for 1,2,4-trimethylbenzene. This would result in a Hazard Quotient below one for this chemical.

Response: The reference concentration of 0.007 ug/m3 for 1,2,4-trimethylbenzene was obtained from the EPA Region 3 Regional Screening Level Resident Air Supporting Table dated November 2011. In a revised version of the table dated May 2013, the reference concentration for 1,2,4-trimethylbenzene remained the same at 0.007 ug/m3. A review of other publically available EPA documents does not indicate the reference concentration has changed to 0.07 ug/m3. Please provide documentation as to this alternative reference concentration value.

EPA response: The subchronic reference concentration for 1,2,4-trimethyl benzene is 0.07 milligrams per cubic meter; there was a typo in EPA's previous comment. In this case the subchronic value has an uncertainty factor of 300 while the chronic value has an uncertainty factor of 3000 which is unusable due to the factor being so elevated. See Attachment A, "1,2,4- Trimethyl benzene Subchronic RfC, excerpt from EPA PPRTV file, 6-11-2007."

15) Tables 3 to 7. The cancer risks may be slightly higher than calculated because ½ the detection limit was used where the RL was greater than screening level. Risk Assessment Guidance for Superfund, Part A (1989) states that other substitutions for non-detects can be used in the risk assessment (e.g., the detection limit). Given the limited indoor air data collected, the use of the detection limit rather than ½ the detection limit in the risk calculations for those chemicals where the RL was greater than the screening level would be appropriate. The rationale provided for including these chemicals in the risk assessment is sound.

Response: Please see the response to Comment No.11. The detection limit can be used as the exposure point concentration; however, this will result in a significant increase in the cancer risk due to compounds not detected, unless detection limits are improved. Three non- detected compounds were responsible for the majority of the cancer risk: 1,2-dibromoethane, benzyl chloride, and vinyl bromide result in a combined cancer risk of 1.26×10^{-5} *at all locations (including the exterior air) when using one-half their analytical detection limits as the exposure point concentration. Assuming no change in detection limits for future samples, use of the detection limit as the exposure point concentration will result in over two-thirds of the total cancer risk to be due to these three undetected compounds; compounds that also were never detected in soil gas samples.*

EPA response: Attribute the risks in the risk characterization section. Use the reporting limit in the risk calculation, not ½ the reporting limit.

Figures

16) Please provide a north arrow on figures 4-7.

Response: North arrows can be added.

EPA response: This comment was not addressed. Please add north arrows to figures 4 and 5.

17) Please revise figures 4 through 7 to show the entire day care/school facility floor plan and to be consistent with figure 3.

Response: The figures can be revised to show more detailed floor plans.

EPA response: This comment has not been addressed. Please provide more information on the extents and orientations of the day care/school facilities (all buildings past and present) as related to the other buildings and entire property.

Additional Recommendations

18) The risk characterization looked at only one pathway of exposure. All risk assessments should be comprehensive and include all exposures and pathways for calculation of cumulative risk. Typically young children engage in a lot of hand to mouth activity so the incidental ingestion and dermal pathways must also be included in the risk assessment for a final remedy.

Response: The purpose of this risk characterization was to look at the indoor air pathway to determine if it was a potential significant exposure pathway. Previous risk assessments at the site had calculated risks to other pathways. From a practical point of view, incidental ingestion and dermal pathways to the children at the schools are not complete as the children spend their time inside the buildings (where exposure to potential historic contaminants underneath the buildings are not possible due to the presence of the building) or in fenced-in outside play areas that are built on the surface with foundations that also are isolated from potential residual historic soil contaminants.

EPA response: This may need to be revisited following completion of the evaluation of the indoor air pathway.

19) The impact of vehicle exhaust on the indoor air sampling should be considered and discussed in the report. In addition, other potential sources such as underground storage tank releases, and those more likely than "cigarette smoke on workers clothing" should be discussed. It would also be useful to include a discussion of what is typically found in indoor air and provide a complete reference to any such studies used in the discussion.

Response: There are no apparent sources that would result in the presence of the petroleum compounds detected in Building 100 Suite 157-J. This is why the report recommended an evaluation of potential indoor sources. The USTs related to the former USM operations were all removed or closed in place in the 1980s and 1990s. MassDEP has information on "typical indoor air concentrations"; however, for the purpose of this risk assessment, risk was calculated for all compounds detected in indoor air without regard to an indoor air background concentration; this provided the most conservative risk calculation. Potential impacts from vehicle exhaust can also be evaluated.

EPA response: Based on the work plan submitted, it's not apparent how this issue will be addressed. If no attempt is made to identify confounding sources, please refrain from attributing contamination to other indoor sources.

20) The reference location chosen for air sampling is likely contaminated with car exhaust and diesel exhaust from the commuter rail. It would be preferable to have at least one reference location that is not impacted by excessive exhaust. The car and train exhaust represent an alternative source of contamination rather than typical background. The grassy areas near the pond and buildings 500 and 600 would provide an alternate location impacted by anthropogenic background and less exhaust. In addition, a sample in this area is likely more representative of background conditions for buildings 500 and 600. Another ambient outdoor air sample may be appropriate between building 100 and

the gas station located off-site to the east of the Cummings Center.

Response: The reference location on the roof of the parking garage was not directly impacted by exhaust from vehicles in the garage. A review of the data from this location confirms this in that the levels of petroleum contaminants were significantly lower than those collected in the inside locations. Many petroleum compounds, including all three hydrocarbon fraction of the APH analysis, were not detected in the reference location. It is clear that this location was not contaminated with car or diesel exhaust. The grassy areas around Buildings 500 and 600 are likely to have more potential impacts from exhaust as they are on ground level and they are directly adjacent to parking lots. Such locations would also be more easily subject to vandalism or interference during sample collection. It is unclear as to the benefit of an off-site ambient location between Cummings Center and an off-site gasoline station, or to which gasoline station the comment is referring to.

EPA response: The previous comment was referring to the gas station located at 449 Cabot Street (according to Google Maps) or at the corner of Cabot and Balch Streets (presumed hydraulically upgradient of Building 100 Suites S-157J and S-149J).

21) Regarding the data evaluation for additional rounds of indoor air sampling, please include an analysis similar to what is provided in Attachment 2.

Response: Again, the purpose of the vapor intrusion guidance policy is to perform sufficient data collection to make the decision as to whether or not vapor intrusion needs to be quantified in a detailed risk assessment as a complete exposure pathway. The risk characterization was performed using a conservative approach and did quantify risk from the indoor air pathway; it included all detected compounds as potential contaminants of concern, regardless of whether the source was from vapor intrusion, indoor source, or other source. By using this conservative approach, much of what is contained in the vapor intrusion policy is no longer relevant, such as the comparison of indoor air data to screening levels (or threshold values). As the results of the risk characterization indicated that no significant risk to indoor air was present in three of the four indoor sampling locations, the source(s) of the contaminants in these three areas is/are not relevant. In the fourth location, where a potential significant risk was calculated based on the presence of petroleum compounds, additional assessment is necessary to clarify the source of these compounds.

EPA Response: The evaluation, previously presented as attachment 2, was intended to help determine if a critical exposure pathway (CEP) exists. The importance of determining if a CEP exists should not be diminished. One or two events, once or twice a year would not likely result in sufficient data to determine a "no further action" decision (e.g., limited data may not be representative of actual exposure). Rather than basing a decision on such limited data, preemptive mitigation (PEM) is often times recommended. This is particularly true where sensitive receptors are involved and an actual pathway is determined to exist. Most often, mitigation is less expensive when compared to extensive indoor air and soil gas sampling.

As previously stated in Attachment 2, additional sampling is warranted for buildings 500 and 600 and building 100 suite S-149-J. It is premature to conclude that there is no risk based on one round of indoor air sampling and limited soil gas sampling that was not

conducted sub-slab or concurrently with indoor air sampling.

Appendices

22) On pages 67 of 74 and 75 of 82, custody seals on the canisters are noted as absent. Please clarify why. This could bring into question the integrity of the samples.

Response: Custody seals were not used in the indoor air sampling. The need for custody samples was not included in the QAPP/SAP. The lack of a custody seal on a Summa canister should not bring into question sample integrity since an attempt to alter the sample post- sample collection would have been detected in the laboratory by a loss of sample and/or significant difference in canister pressure from other canisters.

EPA response: The canisters are typically supplied by the lab in boxes. As an extra measure of quality control, following sample collection, the canisters can be returned to the boxes and a custody seal can be put on each of the boxes. Usually this is done when samples are being shipped off to a lab. However, in this case it may be warranted even if not shipped, since there was a previous issue related to sample custody.

23) The chain of custody form shows that samples were relinquished by someone (name illegible) on 2/6/13 but not received until 2/7/13 (name and time illegible). This could bring into question the integrity of the samples.

Response: The custody issue referred to was the laboratory courier relinquishing the samples at the laboratory at 4:30 PM on 2/6/13, but the chain notes it was not received by the chemist until the next morning. The lab has already been spoken to about this issue.

EPA response: What is the lab's explanation of what happened during the time gap? Is there an issue of sample integrity?

24) Regarding the March 27, 2013 Memorandum from the lab on the field duplicate analysis (below), why wasn't the sample run again if it is possible there was an error with aliquot removal?

> "It should be noted that acceptable RPDs for field duplicates are less than 40% for compounds whose detected values are greater than five times the estimated quantitation limit (EQL); and for compounds whose detected values are less than five times the EQL, value differences between the field sample and its associated duplicate are to be less than 2.5 times the EQL. Based on these criteria, the RPDs for the compounds listed above are acceptable except for 1,2,4-Trimethylbenzene, Acetone, Ethanol, Isopropyl Alcohol, m/p- Xylenes, Styrene, and C9-C12 Aliphatics. Of note is that based on the analysis results, the quantitative results for sample L1302224-02 were consistently lower than the results for sample L1302224-01, meaning there may have been a malfunction in the canister for L1302224-02 or in the sample aliquot removal in the laboratory allowing ambient air to dilute the collected sample. No significant issues with the canisters were noted in the field data or in the analytical analysis report."

Response: The sample holding time had expired by the time the memorandum had been prepared. However, the possible dilution of the one duplicate sample is a moot point, since the risk characterization was based on the maximum values of each individual chemical.

EPA response: We disagree that this is a "moot point." A discussion of how these results impact the overall project objectives should be included. Also, to say the issue was an aliquot removal error is not an appropriate response unless the lab has provided documentation stating that this was in fact the reason for the duplicate discrepancy. Please provide this documentation or a complete reference to where this information can be located.

ATTACHMENT A

1,2,4- Trimethyl benzene Subchronic RfC
excerpt from EPA PPRTV file, 6-11-2007

Provisional RfCs may be derived based on adverse pulmonary or hematological effects reported in male or female rats, respectively, exposed to 1,2,4-trimethylbenzene (97% pure) for 3 months (Korsak et al., 2000). The selection of the Korsak et al. (2000) study as the basis for deriving RfCs is supported by previous observations in rats (Korsak et al., 1997) and humans (Bättig et al., 1958) exposed to pure 1,2,4-trimethylbenzene or a mixture of trimethylbenzenes, respectively, for ≥ 90 days. Indeed, pulmonary lesions and hematological abnormalities in rats exposed to pure 1,2,4-trimethylbenzene for 3 months (Korsak et al., 2000) are consistent with observations in humans following presumably longer duration exposure to a mixture containing 1,2,4-trimethylbenzene (Bättig et al., 1958).

Subchronic p-RfC

The subchronic p-RfC for 1,2,4-trimethylbenzene is derived from the NOAEL of 25 ppm (123 mg/m3) identified in the Korsak et al. (2000) rat subchronic inhalation study. Two different toxic effects (pulmonary or hematological) were identified in male or female rats, respectively, in this study at the same LOAEL/NOAEL. As such, two separate subchronic p-RfC derivations are presented below to identify the most sensitive endpoint. Under an assumption of category 3 for decreased clotting time in female Imp:WIST rats, an adjusted experimental NOAEL can be derived using the NOAEL of 123 mg/m3 and the exposure duration data from Korsak et al.(2000) as follows:

NOAEL[ADJ] (mg/m3) = rat NOAEL (mg/m3) x 6hr/24hr x 5 days/7 days
= 123 mg/m3 x 0.25 x 0.71
= 21.8 mg/m3

According to equation (4-48) for extrarespiratory effects [Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry (EPA/600/8-90/066F October 1994)], a human equivalent concentration (NOAEL[HEC]) can be calculated as follows:

NOAEL[HEC] (mg/m3) = NOAEL[ADJ] (mg/m3) x (Hb/g)A/(Hb/g)H

*blood:gas (b/g) partition coefficients for 1,2,4-trimethylbenzene could not be located, therefore a default value of 1 is used for the term (Hb/g)A/(Hb/g)H .

The human NOAEL[HEC] is equivalent to the duration adjusted rat NOAEL of 21.8 mg/m3. A **subchronic p-RfC of 7E-2 mg/m3** based on a hematological effect is derived by dividing the NOAEL[HEC] of 21.8 mg/m3 by a composite UF of 300, as follows:

UF (animal to human) = 3
UF (interindividual variability) = 10
UF (database deficiencies) = 10

Subchronic p-RfC = NOAEL[HEC] / UF
= 21.8 mg/m3 / 300
= 0.07 mg/m3 or 7E-2 mg/m3

Decreased clotting time in female rats due to subchronic inhalation exposure to 1,2,4-trimethlybenzene is the more sensitive or health protective endpoint under consideration compared to other data derived from toxicity studies.

References

Bättig, K., E. Grandjean, L. Rossi and J. Rickenbacher. 1958. [Toxicological investigations of trimethylbenzene.] Archiv fuer Gewerbepathol. Gewerbehyg. 16:555-566. [German, with English translation]

Korsak, Z., K. Rydzyński and J. Jajte. 1997. Respiratory irritative effects of trimethylbenzenes: An experimental animal study. Int. J. Occup. Med. Environ. Health. 10:303-311.

Korsak, Z., J. Stetkiewicz, W Majcherek, I. Stetkiewicz, J. Jajte and K. Rydzyński. 2000. Sub-chronic inhalation toxicity of 1,2,4-trimethylbenzene (pseudocumene) in rats. Int. J. Occup. Med. Environ. Health. 13(2):155-164.